MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

DBM5114 – BUSINESS MATHEMATICS

(All sections / Groups)

14 OCTOBER 2019
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **SIX (6) pages** including cover page with **4 Questions** only.
2. Answer all **FOUR (4)** questions
3. Write all your answers in the answer booklet provided.
4. Only NON-PROGRAMMABLE calculators are allowed.

Question 1 (25 Marks)

a) Solve for x.

i. $2x + 4 = -6x - 4$ **(3 marks)**

ii. $x^2 + 6x + 8 = 0$ **(3 marks)**

iii. $-4x - 10 < -2x + 4 < 3x + 5$ **(6 marks)**

b) Reduce the rational expression to the lowest term.

$$\frac{x^2+5x+6}{x^2-2x-8}$$ **(4 marks)**

c) Find a straight line equation that parallel to line $y = 2x + 4$ and containing point $(-2,5)$. **(4 marks)**

d) Current value of a machine is RM50 000 and has a life expectancy of 20 years. At the end of its useful life, the machine will have a value of RM 15 000. Find an equation for the value, V for the machine at any time, t. **(5 marks)**

Question 2 (25 Marks)

a) Given

$$A = \begin{bmatrix} -4 & 5 & -1 \\ 2 & 4 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 8 & 5 \\ 1 & -3 \\ 4 & 2 \end{bmatrix} \quad C = \begin{bmatrix} -1 & 3 & 2 \\ 4 & 7 & 3 \\ 2 & -5 & 3 \end{bmatrix}$$

Perform the indicated operation.

i. $A^T + 2B$ **(4 marks)**

ii. $A.C$ **(6 marks)**

b) Solve the system of equations by using Cramer's Rule.

$$\begin{aligned} x + y + z &= -2 \\ 3x - y + 2z &= 6 \\ 2x + 2y - z &= 4 \end{aligned}$$ **(15 marks)**

Continued...

Question 3 (25 Marks)

a) RM15 000 is invested for 5 years with simple interest rate 10% per annum. Find the accumulated amount at the end of investment period. **(4 marks)**

b) Determine which interest rates provide a better return.

i. 4.5% compounded monthly. **(4 marks)**
ii. 5% compounded quarterly. **(5 marks)**

c) RM150 is invested every month for 3 years at 10% rate compounded monthly

i. What is the future value of this annuity at the end of the investment period? **(5 marks)**

ii. How much is the interest earned? **(2 marks)**

d) Hamid buys a house worth RM500 000 and he pays equal monthly instalments for 30 years with interest rate 4.5% compounded monthly. Find the monthly payment to amortize his loan. **(5 marks)**

Question 4 (25 Marks)

a) Find the derivative of the following functions.

i. $f(x) = 2x^{\frac{1}{4}} + 4x^{-\frac{1}{3}} + 2x - 7$ **(2 marks)**
ii. $f(x) = (x-3)(2x^2-5)$ **(5 marks)**

b) Find the interval of increasing and decreasing of the function

$$f(x) = x^3 - 6x^2 - 15x + 10$$ **(12 marks)**

c) Evaluate

$$\int_{-2}^{8} (3x^2 + 4)\, dx$$ **(6 marks)**

End of Questions.

Course: Business Mathematics
Code: DBM5114

Matrices

Inverse of a 2 × 2 matrix

If $A=\begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then $A^{-1}=\frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$, where $ad-bc\neq 0$.

Determinant of a 3 × 3 matrix

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = a_1\begin{vmatrix} b_2 & c_2 \\ b_3 & c_3 \end{vmatrix} - b_1\begin{vmatrix} a_2 & c_2 \\ a_3 & c_3 \end{vmatrix} + c_1\begin{vmatrix} a_2 & b_2 \\ a_3 & b_3 \end{vmatrix}$$

$|A| = a_{11}c_{11} + a_{12}c_{12} + a_{13}c_{13}$

Cramer's Rule for 3 × 3 matrix

$a_1x + b_1y + c_1z = d_1$
$a_2x + b_2y + c_2z = d_2$
$a_3x + b_3y + c_3z = d_3$

then $x=\frac{D_x}{D}, y=\frac{D_y}{D}, z=\frac{D_z}{D}$ where

$$D=\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix},\ D_x=\begin{vmatrix} d_1 & b_1 & c_1 \\ d_2 & b_2 & c_2 \\ d_3 & b_3 & c_3 \end{vmatrix},\ D_y=\begin{vmatrix} a_1 & d_1 & c_1 \\ a_2 & d_2 & c_2 \\ a_3 & d_3 & c_3 \end{vmatrix},\ D_z=\begin{vmatrix} a_1 & b_1 & d_1 \\ a_2 & b_2 & d_2 \\ a_3 & b_3 & d_3 \end{vmatrix}$$

Mathematics of Finance

Simple Interest

(i) Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)
(ii) Accumulated amount, $A = P(1 + rt)$

Compound Interest

(i) Accumulated amount, $A = P(1+i)^n$, where $i=\frac{r}{m}$, and $n = mt$
(m = number of conversion periods per year)

(ii) Present value for compound interest, $P = A(1+i)^{-n}$

Continued...

Effective Rate of Interest

$$r_{eff} = \left[1 + \frac{r}{m}\right]^m - 1$$

Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$ (S = future value of ordinary annuity of n payments of R dollars periodic payment)

Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$ (P = present value of ordinary annuity of n payments of R dollars periodic payment)

Amortization Formula

$$R = \frac{Pi}{1-(1+i)^{-n}}$$ (R = periodic payment on a loan of P dollars to be amortized over n periods)

Sinking Fund Formula

$$R = \frac{Si}{(1+i)^n - 1}$$ (R = periodic payment required to accumulate S dollars over n periods)

Basic Rules of Differentiation

(i) Constant, $f(x) = c$: $f'(c) = 0$

(ii) Power rule, $f(x) = x^n$: $f'(x) = nx^{n-1}$

(iii) Constant multiple a function, $cf(x)$: $cf'(x)$

(iv) Sum or difference rule, $f(x) \pm g(x)$: $f'(x) \pm g'(x)$

(v) Product rule, $f(x) = u.v$: $f'(x) = uv' + vu'$

(vi) Quotient rule, $f(x) = \frac{u}{v}$; $f'(x) = \frac{vu' - uv\prime}{v^2}$

(vii) Chain rule: Derive $g[f(x)] = g'[f(x)]f'(x)$

(viii) General power rule: Derive $[f(x)]^n = n[f(x)]^{n-1} f'(x)$

(ix) Exponential function:

$f(x) = e^x$; $f'(x) = e^x$

$f(x) = e^{f(x)}$; $f'(x) = e^{f(x)}f'(x)$

(x) Logarithmic function:

Derive $\ln x = \frac{1}{x}$

Derive $(\ln u(x)) = \left(\frac{1}{u(x)}\right)[u'(x)]$

Continued...

Basic Rules of Integration

(i) $\int k\,dx = kx + C$

(ii) $\int x^n\,dx = \frac{x^{n+1}}{n+1} + C$

(iii) $\int kf(x)\,dx = k\int f(x)dx$

(iv) $\int (f \pm g)(x) = \int f(x)dx \pm \int g(x)dx$

(v) $\int e^x dx = e^x + C$

(vi) $\int \frac{1}{x}\,dx = \ln x + C$

Application of Integrals:

Areas Between Curves

$$A = \int_a^b [f(x) - g(x)]dx$$

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